Procurement Reference No. EV 03-0055-C

Task Assignment and Scope of Work
Task C: Narrative Nutrient Criteria Development

1. **Task Assignments**

1.1   This Task Assignment is for professional environmental consulting services to assist the Department in developing Narrative Nutrient Criteria and associated implementation procedures.   ADEQ is seeking a Contractor to provide statistical analysis, modeling, technical support, and technical writing services.

1.2   This Task Assignment seeks Contractor support in the development of the nutrient criteria and in integrating basin factors to inform nutrient endpoints.

1.2.1   The initial focus of this Task Assignment is Arizona's lakes and reservoirs. There is a need to focus attention on reservoirs and the protection of key designated uses. As collection basins, reservoirs are complex and unique in their character, reflecting among other factors: different upstream inputs (e.g., land use, source water), basin lithology, soils, and weather patterns, not to mention the differing aspects of their character defined by morphology, retention time, mixing regime, and trophic hierarchy.

1.2.2   Once endpoints are established for each reservoir, based on the particular goals of each in meeting its designated uses, rivers and streams which are tributary to the reservoir can be managed within the context of contributing loads, local conditions, and sub-watershed characteristics.

1.3   The Task Assignment also requires the Contractor to develop written procedures for implementation of the narrative criteria in the water quality assessment process, §303(d) listing process and in the Arizona Pollutant Discharge Elimination System (AZPDES) permit program.

1.3.1   The regulations governing the AZPDES Program requires that effluent limitations be established for a pollutant or pollutant parameter which may be discharged at a level that will cause or have reasonable potential to cause or contribute to the exceedance of a state narrative or numeric water quality standards [40 CFR 122.44(d)(1).]

1.3.2   Where nutrient impacts have been identified and cannot be addressed through the application of technology, these problems must be addressed through the total maximum daily load (TMDL) program to determine assimilative capacity and establish allowances, in the form of both wasteload and load allocations, to be implemented through the water quality implementation plan.

2. **Regulatory Authority**

2.1   A.R.S. §49-202(A) designates ADEQ as the state agency for all purposes of the Clean Water Act. As the state agency responsible for implementing the Clean Water Act in Arizona, ADEQ has a duty to adopt water quality standards for Arizona's rivers, streams, and lakes.

2.2   Water quality standards define the water quality standards of a water body or a portion of a water body by designating the use or uses to be made of the water, by setting water quality criteria necessary to protect the designated uses, and by preventing degradation of water quality. Designated

uses in Arizona Surface Water Quality Standards (Arizona Administrative Code, Title 18, Chapter 11, Article 1) include: Domestic Water Source, Aquatic & Wildlife (warm water, cold water, ephemeral, effluent dependent), Full Body Contact, Partial Body Contact, Fish Consumption, Agricultural Livestock Watering, and Agricultural Irrigation. ADEQ has adopted, by rule, numeric and narrative water quality standards for Arizona's surface waters. The narrative standards apply to all water bodies listed in Appendix B.

2.3   ADEQ has also adopted narrative water quality standards for nutrients and toxic substances in addition to specific numeric water quality standards for individual chemical compounds. Among the narrative standards is a prohibition against nutrients that could stimulate unwanted growth of aquatic plants. The narrative nutrient standard is a reflection of the federal narrative criteria and reads as follows [R18-11-108(A)(1-8)] where *italics* denote possible nutrient involvement:

A surface water shall be free from *pollutants in amounts or combinations* that:
1. Settle to form bottom deposits that inhibit or prohibit the habitation, growth, or propagation of aquatic life;
2. *Cause objectionable odor* in the area in which the surface water is located;
3. *Cause off-taste or odor in drinking water;*
4. Cause off-flavor in aquatic organisms;
5. *Are toxic [algal toxins] to humans, animals, plants, or other organisms*;
6. *Cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth, or propagation of other aquatic life or that impair recreational uses*;
7. Cause or contribute to a violation of an aquifer water quality standard prescribed in R18-11-405 or R18-11-406; or
8. *Change the color of the surface water from natural background* levels of color.

3.   Legal Requirements to Develop Implementation Procedures

Recently-enacted state law requires ADEQ to develop implementation procedures for narrative water quality standards before they can be used for §305(b) water quality assessment, §303(d) listing purposes, and permit compliance. A.R.S. §49-232(F) requires ADEQ to adopt implementation procedures for each narrative standard that specifically identifies the objective bases for determining that a violation of the narrative standard exists. State law requires that the availability of the implementation procedures be publicly noticed and that the public be given an opportunity to comment on the procedures. Finally, no Total Maximum Daily Load (TMDL) analysis can be prepared that is designed to achieve compliance with a narrative water quality standard until implementation procedures are adopted by ADEQ.

4.   History of Nutrient Standards in Arizona

4.1   In 1976, EPA promulgated numeric nutrient standards for several states, including Arizona, particularly where interstate or international waters were concerned. 40 CFR 131.31 contains nitrate-N and/or phosphate-P standards for all the major river systems in Arizona. In the early 1980s, the department derived more protective standards for several of these river systems, opting for total nitrogen and total phosphorus over nitrate as N or phosphate as P. EPA is currently in the process of de-promulgating the federal standards set in 1976, in favor of the state adopted standards.

4.2   The statistical methods used in the 1980s did not include analysis of reservoir processes or nutrient inputs from the watershed. Long term data collected at USGS gaging stations were used to describe

the "as is" condition for each river system statistically; then single sample maximum, annual mean, and 90th percentile criteria were chosen. There have been very few violations of the numeric 'standards' within the rivers themselves, except for localized conditions along some tributaries. Nutrient values in the major reservoirs carrying these standards have also not shown numeric exceedances, though changes in trophic status or condition have been noted.

4.3   On January 19, 2001, EPA published federal nutrient criteria for rivers, lakes, and estuaries, based on an eco-regional approach. States are required to either develop their own criteria or adopt the new federal criteria by 2004. Those States considering development of alternative criteria were required to develop a nutrient criteria workplan by December, 2001,which outlines the process they plan to use. Arizona's nutrient criteria workplan is attached (*See* Attachment).

4.4   ADEQ has previously developed Implementation Guidelines for the Narrative Nutrient Standard (January 16, 1996) [*See* Attachments]. This document provides background on the agency's early efforts to develop guidance which was focused on rivers and streams and geared toward intensive and localized study. While this approach may be scientifically sound in articulating the complexities of local conditions, it is very resource-intensive to execute on an individual water body basis without a priori endpoints upon which to base the analysis.

5.   Nutrient Criteria Workplan

5.1   Due to the nature of nutrients, the diverse sources of these pollutants and the different factors that affect their behavior, the determination of the need for nutrient controls and the level of controls necessary to protect the beneficial uses of a receiving water is complex.

5.1.1   Rather than relying on numeric nutrient data and criteria alone, the ADEQ proposes to develop a "matrix" of factors that could be applied to determine compliance with the narrative nutrient standard in lakes and reservoirs. This approach is in keeping with EPA's 2000 Nutrient Criteria Technical Guidance Manual, which describes use of an index that relates scores from multiple factors ('translators') in a comprehensive, non-dimensional score. As noted in Section 1.2.2, once lakes and reservoirs are addressed, streams and river which contribute to that system will be managed within the context of contributing loads, local conditions, and sub-watershed characteristics. Implementation procedures for streams and rivers may also take the form of a matrix or other workable format.

5.2   The desired end product is a matrix of indicators (or translators) that inform lake and reservoir condition relative to nutrient inputs and nutrient cycling and determine compliance with the narrative nutrient standard. The choice of indicators and their threshold values (or ranges) will be derived by classifying lakes according to watershed chemistry, land uses, and various aspects of lake morphology, function and ecology. The matrix must account for these distinct classes' or 'categories' and protect for the most critical designated end use.

5.3   To be truly non-dimensional, ADEQ contemplates the need to first classify lakes and reservoirs into groups that share sets of like characteristics and/or process responses, and then develop a matrix for each of those classifications. In this way, the matrix would be stratified to accommodate major differences in lake functionality and the endpoints necessary to meet critical designated uses. This approach is similar to the one being taken by the EPA Region IX Technical Advisory Group (RTAG), which currently focuses on development of nutrient criteria for California.

6.   Summary of Project Tasks (see Section 8 for breakout of responsibilities)

6.1   Statistical analysis of selected water quality parameters: basic descriptive statistics, frequency distribution, tests for normalcy, box plots.   All data must meet Arizona's new "credible data" rule which includes QA/QC requirements (A.A.C. Title 18, Chapter 11, Article 6).

6.2   GIS analysis of watershed eco-regional and geochemical characteristics: geology, soils, precipitation, vegetation types, water source.

6.3   Analysis of lake morphometric, mixing, and flow characteristics; ratio of lake to watershed size.

6.4   Further statistical analysis and/or multi-metric analysis of water quality parameters, watershed factors, and lake factors.

6.5   Derive lake classification categories.

6.6   Identify key endpoint parameters and values or range of values for each critical designated use. For example: domestic water source: (organic carbon > trihalomethanes, algal species > taste&odor); aquatic & wildlife: (dissolved oxygen, ammonia, N:P ratio, trophic state/biomass/trophic structure/food source, habitat, fish survival, fish reproduction); fish consumption (algal species > taste& odor); and swimming/full body contact: (bacteria, clarity, algal toxins).

6.7   Test robustness of each endpoint for inclusion in narrative nutrient implementation matrix, per category. [Note: these 'threshold' values will be promulgated in rule; see Section 7]

6.8   Develop narrative nutrient matrix to assess compliance with numeric endpoints for each major lake "class".

6.9   Modeling analysis to determine watershed loading (total N, total P, total organic carbon) and lake response per key endpoint, per lake category (may need to simulate using default input parameters for lakes where tributary, runoff, or snowmelt data are lacking).

6.10   Develop written implementation procedures for using the matrices in assessing compliance with the narrative nutrient water quality standard in lakes and reservoirs.

6.11   Develop written implementation procedures for using the matrices in assessing compliance with the narrative nutrient water quality standard in river and streams.

7.   Lake Groupings/Classification System and Matrices - for designated use attainment

7.1   ADEQ envisions application of developed narrative nutrient matrices to guide designated use refinement where necessary. Translators must protect for the most stringent nutrient-impacted use of each water body. Existing use categories may be subdivided where data analysis and/or modeling demonstrates watershed or lake type specificity, or where it can be proven necessary to meet economic or technical constraints.

Note: "classes" for rule development purposes - as *suggested* below - are not necessarily expected to directly reflect lake classification categories derived from shared watershed or morphological attributes, but will be chosen to reflect defensible designated use refinements.]

7.1.1   *Possible* breakdown of major reservoirs by basin/link in chain/most critical designated use e.g.:

Class 1A: Domestic water source (Colorado)
Class 1B: Domestic water source (Salt)
Class 1C: Domestic water source (Verde)
Others?

7.1.2   *Possible* breakdown of impoundments initially created for irrigation but now used for recreation/most critical designated use (perennial or seasonal/ephemeral or source water subdivisions) e.g.:

Class 2A: Recreation (mean depth < 4 m): support of aquatic & wildlife - *native species* [fishing, swimming, boating, & aesthetics secondary]
Class 2B: Recreation (mean depth > 4 m): support of aquatic & wildlife - *native species*, [fishing, swimming, boating, & aesthetics secondary]
Class 2C: Recreation (mean depth < 4 m): support of aquatic & wildlife, *non- native* species. [fishing, swimming, boating & aesthetics secondary]
Class 2D: Recreation (mean depth > 4 m): support of aquatic & wildlife *non-native* species. [fishing, swimming, boating & aesthetics secondary]
Others? : e.g., limited fishery or non-fish consumption

7.1.3   *Possible* breakdown of impoundments within urban environment e.g.:

Class 3A: Recreation (urban lakes, non-reclaimed water): support of aquatic & wildlife, *non-native* species. [fishing, swimming, boating & aesthetics secondary]
Class 3B: Recreation (urban lakes, reclaimed water): support of aquatic & wildlife, *non-native* species. [fishing, swimming, boating & aesthetics secondary]
Others? : e.g., limited fishery or non-fish consumption

7.1.4   *Possible* breakdown of impoundments created and used for irrigation only

Class 4A: Irrigation: incidental support of aquatic & wildlife, public access with partial body contact
Class 4B: Irrigation: incidental support of aquatic & wildlife, no public access without partial body contact

8.   Task Assignments

8.1   ADEQ Lakes Program will provide:

a.   Compile lake data* to be analyzed: nutrient species, alkalinity, total dissolved solids, carbonate/bicarbonate, hardness, total organic carbon/dissolved organic carbon, chlorophyll (and algae species where available), key anions/cations/metals, turbidity, secchi depth
       * approximately 60 lakes statewide; 1-11 years of data;
b.   Provide basic statistics for these data (descriptive, frequency distribution, test for normalcy, box plots, correlation);
c.   Compile basic lake characteristics (size in surface acres, mean depth, elevation, source water, morphology, age, flow regime);
d.   Compile GIS covers (watershed data);
e.   Contact and oversight for this project

8.2   Contractor to provide:

8.2.1   Services

    a.   Synopsis of data analyses
    b.   Recommendations for further analyses (statistical & modeling)
    c.   Development of lake 'classes' with numeric nutrient endpoints (could be a range)
    d.   Development of lake translator 'matrix' for interpretation of narrative nutrient standard
    e.   Development of narrative nutrient implementation procedures for lakes and reservoirs
    f.   Development of narrative nutrient implementation procedures for streams and rivers
    g.   Participation in stakeholder local meetings

8.2.2.   Deliverables

    a.   Interim reports (see schedule)
    b.   Lake classification system
    c.   Matrix for interpretation of narrative nutrient standard
    d.   Written implementation procedures for lakes and reservoirs
    e.   Written implementation procedures for streams and rivers

9.   Public Participation

ADEQ will conduct a stakeholder process to develop the narrative nutrient criteria. ADEQ will hold meetings to take public comment on draft documents. The Contractor will be required to participate in the stakeholder process and the public meetings to provide explanations of technical issues pertaining to development of the criteria. The narrative nutrient criteria, once developed, and any associated thresholds or "triggers", must be adopted in rule through the State's rulemaking process. The criteria must be publicly noticed and the public given an opportunity to comment.   The Contractor may be asked to respond to public comments and questions received during the public participation process relating to technical issues pertaining to development of the criteria and to assist ADEQ in the development of responsiveness summaries.

10.   Submittals / Deliverables

The final deliverables for this Task is a lake classification system and interpretation matrix. In addition to hard copies of the classification system and the matrix, the Contractor shall provide final deliverables in electronic format compatible with the current ADEQ word processing software (currently Wordperfect 8.0). Note: ADEQ is planning on converting to Microsoft Office word processing software by late FY03. If or until that happens, final products must be submitted in Wordperfect 8.0.

11.   Administrative Requirements

11.1   Contractor shall provide support to ADEQ in the stakeholder and public meetings, as required, and in responding to public comments, as needed. The timeframe for this work is yet to be determined.

11.2   Deliverables, technical correspondence and reports from the Contractor may be sent by express mail, or by fax with the original sent by regular mail, or hand delivered to ADEQ at the following address:

        Susan Fitch, Project Manager
        Water Quality Division
        Arizona Department of Environmental Quality
        1110 W. Washington Street

Phoenix, Arizona 85007
Phone: (602) 771-4541
fitch.susan@ev.state.az.us

11.3   Correspondence to the Contract Officer shall be sent in the same manner as above to the following address:

Linda Wright, Contract Officer
Contracts and Procurement
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, Arizona 85007
Phone: (602) 771-4711
wright.linda@ev.state.az.us

12.   Task Assignment Offers (TAO)

12.1   Task Assignment Offers shall be prepared as described as described in the TMDL Development RFP's Special Terms and Conditions. Resumes need not be submitted with the TAO.

12.2   Please submit any questions regarding this TASOW in writing to the Contract Officer by December 5, 2002 by noon.

12.3   Offerors shall submit one original and two copies of the Task Assignment Offer. Offers shall be due at ADEQ Procurement, First Floor Lobby, 1110 W. Washington Street, Phoenix, Arizona, on **December 13, 2002 at 3:00 p.m.** Offers must be in the actual possession of ADEQ by the time and date above. Late offers will not be considered.

12.3.1 **Task Assignment Offers must be submitted in a sealed package with the Procurement Reference Number and the Offeror's name and address clearly indicated on the package.**

12.4   Evaluation of Task Assignment Offers: An initial evaluation of TAOs will be made on Adequacy of Staff Resources. Contractors must provide staffing levels that are adequate to meet the requirements and timelines of the TASOW. ADEQ will further evaluate those TAOs that meet this requirement based on the factors below, listed in order of importance:

12.4.1 Experience, Expertise, and Reliability in Tasks related to statistical analysis, modeling, technical support and writing, and the implementation of surface water quality standards, including narrative nutrient standards;

12.4.2 Method of Approach to the TASOW; and

12.4.3 Overall Cost.

Time line for
Task C: Nutrient Criteria Development and Associated Implementation Procedures

Deliverable X = Deliverable	FY' 2003												FY' 2004 Month						Due Date
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	
1 ( ) Kickoff Stakeholder Meeting																			**(December, 2002)**
2 ( ) Data Summary Recommend Statistical Tests & Models		X																	**3/01/03**
3 ( ) Stakeholder Meeting			X																**3/15/03**
4 ( ) Conduct analyses				.....................…......X															**6/30/03**
5 ( ) Statistical Summary and Modeling Report							X												**6/30/03**
6 ( ) Stakeholder Meeting							X												**7/15/03**
7 ( ) Define Lake Classification System w/ Numeric Nutrient Expectations									....…...................X										**09/30/03**
8 ( ) Stakeholder Meeting										X									**10/15/03**
9 ( ) Develop Matrix for Narrative Nutrient Implementation												X							**2/01/04**
10 ( ) Stakeholder Meeting														X					**02/15/04**
11 ( ) Develop Implementation Procedures															 X				**5/01/04**
12 ( ) Stakeholder Meeting																	X		**06/01/04**
13 ( ) Rule Package for Narrative Nutrient Implementation																	X		**07/01/04**

Cross Section of Available References

Ambient Water Quality Criteria Recommendations: Lake and Reservoirs in Nutrient Ecoregion III. December 2001. EPA Office of Water, EPA 822-B-01-008.

Ambient Water Quality Criteria Recommendations: Lake and Reservoirs in Nutrient Ecoregion II. December 2000. EPA Office of Water, EPA 822-B-00-007.

Arizona Clean Lakes Classification Study. 1983. Arizona Water Quality Control Council.

Fact Sheets: Ecoregional Nutrient Criteria. 2000, 2001. EPA Office of Water, EPA 822-F-00-007 and EPA 822-F-01-010.

Lake and Reservoir Bioassessment and Biocriteria Technical Guidance Document. 1998. EPA Office of Water, EPA 841-B-98-007

Lake Classification and Chemical and Physical Properties of Lakes *in* Ecological Effects of Stocked Trout in Naturally Fishless High Mountain Lakes. 1995. North Cascades National Park Service Complex, WA.

Lake Classification Systems - Parts I and II.. 1999. MLSWA Science Advisory Committee on Lake Systems.

National Nutrient Assessment Strategy: An Overview of Available Endpoints and Assessment Tools. January 2000. EPA Office of Water Nonpoint Source Proceedings.

Nutrient Criteria Adoption Plan, Main Department of Environmental Protection. February, 2002.

Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs. April 2000. EPA Office of Water, EPA-822-B00-001.

Protocol for Developing Nutrient TMDLs. 1999. EPA Office of Water, EPA 841-B-99-007.

Synopsis-1: Eutrophication of Lakes and Effects of Global Warming, Acid Deposition & UV-B Penetration. 2000. Soil and Water Conservation Society of Metro Halifax.

Technical Support Manual: Water body Surveys and Assessments for Conducting Use Attainability Analyses. Vol. III. Lake Systems. 1984. EPA Office of Water.

The Development of Nutrient Criteria for Ecoregions Within: California, Arizona, and Nevada (White Paper). Draft 2002. Prepared by Tetra Tech, Inc. for EPA Region IX Regional Technical Advisory Group & CA SWRCB State Regional Board Advisory Group.

The Ohio Lake Condition Index: A new multiparameter approach to lake classification. 1989. Ohio Environmental Protection Agency.

United States Water Quality Programs that use Algae as a Biological Assessment Tool. 1999. North Carolina Division of Water Quality.